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1913

A COURSE OF STUDY

IN

Agriculture for High Schools

A SUPPLEMENT TO THE

State High School Course

Prepared Under the Direction of

W M. P. EVANS

State Superintendent of Public Schools



AUGUST, 1913

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THE HUGH STEPHENS PRINTING COMPANY
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FOREWORD.

Jefferson City, August 25, 1913.

To Teachers:

Agriculture is now established as a public school subject. It has passed the experimental stage and the results have caused a great demand to spring up from among the patrons. It now remains for you to justify this demand and to lead the young people in your charge to turn their natural curiosity into investigation of this branch of science most nearly related to themselves in their present environment.

In the high school the teaching of history does not make historians; the teaching of mathematics is not aimed at the creation of mathematicians; nor does the teaching of agriculture prepare farmers. All are intended to create citizens, a group of men and women better prepared to live full, complete lives, no matter what their surroundings may become. We want these young people to observe, to classify, to get the habit of meeting new conditions with confidence in themselves, to learn that man can improve his environment.

Carver, in his *Rural Economics*, says: "It is not too much to say that if our educational system succeeds in developing a progressive attitude of mind, a genuine desire to be always improving, our people will manage in some way to get the necessary technical knowledge of agriculture. If, in addition to the development of the progressive attitude, the schools can supply the farmer with technical knowledge, they will have done doubly well."

I advise all teachers of agriculture to get this book and read it and thereby get the inspiration and enthusiasm for the life of service to which they have devoted themselves.

This booklet has been prepared for your help and it is hoped that you will be better able with it to meet the demands made upon you. That the work will be arduous no one questions. I sincerely hope you will be enabled to see that it is worth while.

Yours truly,

WM. P. EVANS,
State Superintendent of Public Schools.

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AGRICULTURE IN THE AMERICAN HIGH SCHOOL.

“The American high school is a form of secondary education created to meet the demand for a broader education and today it is the most powerful agency in shaping the character of American life, both rural and city. High schools can serve all classes of people if they are properly organized and conducted.

It may be impossible at present to agree upon just what should be included in a high school course of study. To a limited extent, the course should be fitted to local needs. The subjects taught are important, but the spirit of the teacher and of the school, and the attitude of both to the several vocations in life are of the most vital concern.

The function of the public high school is to give the student certain information, training and culture, and at the same time enable him to find out what he likes to do. The school, therefore, should give him a carefully planned course of development, adapted to his needs, and present the subjects as rapidly as his ability is discovered. High school work should also inspire him to continue his educational training, if circumstances warrant.

The 20th century definition of a “liberal education” seems to include, (a) all that is worth while of the classics; (b) all that is worth while of sciences and mathematics; (c) certain vocational instruction and training.

The means and methods of the high school should enable the boy to get a purpose in life before he leaves the high school. This will be most valuable to him in any event, no matter what he may do in his after life, because it will mean wiser and more economic use of both time and money.

Vocational subjects presented in the high school afford opportunity for the application of ideas and principles during the process of training, and thus utilize an important pedagogical principle. These subjects also appeal to the instincts of the student, such as curiosity, imitation, acquisitiveness, manipulation and expression, and thus stimulate both interest and application.

We are passing through the experimental stage in secondary agriculture, but the experiments already tried have proven beyond question its utility from an educational as well as from a practical standpoint. This is shown through the increased general interest in all high school work where the subject is taught, and from the results attained by the students in actual practice on the home farm."—Bulletin No. 7, Michigan Agricultural College.

Uniformity:

The Forty-seventh General Assembly passed laws granting state aid to high schools as follows:

1. To high schools having both a unit of agriculture and a teachers' training course approved. (Crossley-Snodgrass Teacher-Training Course Law.)

2. To high schools having a unit of agriculture approved and the maximum levy voted. (Wilson-McRoberts High School Aid Law.)

3. To high schools having a unit of agriculture approved and an organization formed under the new consolidation law. (Buford-Colley Consolidation Law.)

The enactment of these laws placing emphasis on the teaching of agriculture, and the fact that more than fifty per cent of the approved high schools of the state are already offering a course in agriculture, make it necessary that some effort be made toward uniformity in equipment and in course of study. For this purpose this department prints this circular containing a syllabus of a course in agriculture, lists of required equipment in laboratory and library, and general suggestions to teachers.

LABORATORY AND LIBRARY.

REQUIRED BOOKS.

Lyon & Fippin: <i>Principles of Soil Management.</i>	Macmillan.....	\$1.75
King: <i>The Soil.</i>	Macmillan.....	1.50
Vivian: <i>First Principles of Soil Fertility.</i>	Orange Judd Co.....	1.00
Burkett: <i>Soils.</i>	Orange Judd Co.....	1.00
Bowman & Crossley: <i>Corn.</i>	Author, Ames, Iowa.....	2.00
Warren: <i>Farm Management.</i>	Macmillan.....	1.75
Bailey: <i>Vegetable Gardening.</i>	Macmillan.....	1.50
Powell: <i>Co-operation in Agriculture.</i>	Macmillan.....	1.50
Wilson: <i>Evolution of a Country Community.</i>	The Pilgrim Press.....	1.25
G. E. Day: <i>Productive Swine Husbandry.</i>	Lippincott.....	1.50
W. A. Henry: <i>Feeds and Feeding.</i>	Author, Madison, Wis.....	2.25

Mumford: <i>Beef Production</i> . Author, Urbana, Ill.....	1 50
Plumb: <i>Types and Breeds of Farm Animals</i> . Ginn & Co.....	2 00
Harper: <i>Animal Husbandry for Schools</i> . Macmillan.....	1.40
Brigham: <i>Progressive Poultry Culture</i> . Torch Press.....	1.30
Hunt: <i>Forage and Fiber Crops</i> . Orange Judd Co.....	1.75
Bailey: <i>Fruit Growing</i> . Macmillan.....	1.50
Bailey: <i>Plant Breeding</i> . Macmillan.....	1.25
At least one good farm paper.....	1.00

Textbooks.

Warren: <i>Elements of Agriculture</i> . Macmillan.....	\$1.10
Ferguson: <i>Elementary Principles of Agriculture</i> . Ferguson Publishing Co....	1.00
Goodrich: <i>First Book of Farming</i> . Doubleday, Page & Co.....	1.00
Mayne & Hatch: <i>High School Agriculture</i> . American Book Co.....	1.00
Jackson & Daugherty: <i>Agriculture</i> . Orange Judd Co.....	1.50
Halligan: <i>The Fundamentals of Agriculture</i> . D. C. Heath & Co.....	1.20

It is believed that better work will be done if the teacher should use a number of good texts. If four or five copies of each of the above named books are purchased, it will be unnecessary for the students to purchase any textbook.

Laboratory Manuals.

Elliff: <i>A Unit in Agriculture</i> . Row, Peterson & Co.....	\$.50
Call & Schafer: <i>A Laboratory Manual of Agriculture</i> . Macmillan.....	.92

It will be necessary for each student to purchase a manual for his own use. The above named manuals are considered the best published and one of them should be adopted.

Required Equipment for a Class of Sixteen Pupils.

2 doz. student lamp chimneys, 75c.....	\$1.50
2 doz. wide-mouthed bottles, per doz., 26c., 1 oz.....	.52
2 doz. wide-mouthed bottles, per doz., 45c., 6 oz.....	.90
4 thistle tubes, 10c.....	.40
1 lb. glass tubing, one-fourth inch.....	.44
4 thermometers, chemical, centigrade, at 60c.....	2.40
6 doz. test tubes, 8x1.....	3.00
1 "Cenco" trip scale.....	6.65
1 set weights.....	1.65
1 Babcock milk and cream tester.....	5.50
8 shallow pans, at 35c.....	2.80
4 glass funnels, 3-inch, at 12c.....	.48
2 sieves, 20 mesh	6.45
2 sieves, 60 mesh	
1 sieve, 100 mesh	
1 lb. glass rods—small.....	.50
1 lb. glass tubing—small diameter.....	.50
8 tripod microscopes, 44c.....	3.52
1 soil auger.....	3.00
2 percolation cylinders.....	3.50

2 evaporation cylinders.....	5.00
2 graduated cylinders, 65c., 100 cc.....	1.30
3 blast lamps, gasoline, \$2.75.....	8.25
	<hr/>
	\$58.26

(The apparatus listed above when purchased in one order will cost about \$51.00, transportation charges prepaid.)

Material to be Purchased at Home. (Required.)

- 4 Mason's pint fruit jars.
- 4 doz. 4-inch flowerpots with saucers.
- 3 doz. 6-inch flowerpots with saucers.
- 16 heavy dinner plates.
- 16 panes of glass, 8x11.
- 1 tiling spade.
- 1 table, 3½ ft. x 12 ft.
- 1 suitable case for storing apparatus.

At least an acre of ground should be provided. This can be purchased or leased.

Apparatus Not Required, But Very Desirable.

2 soil thermometers.....	\$2.50
1 dissecting microscope.....	9.50
1 bucket sprayer.....	5.00

The apparatus may be purchased of the Central Scientific Company, Chicago, Ill.; the W. M. Welch Mfg. Co., Chicago, Ill., 100 Lake St., or any other standard scientific apparatus company. The books may be secured through A. C. McClurg & Co., Chicago, Ill., or ordered direct from the publisher. There will be a discount of about ten per cent on apparatus and about twenty per cent on books from the prices here listed.

Schools offering a course in agriculture for approval should purchase the entire list of *required* apparatus and books.

Collection of Material.

The following materials must be collected and stored during the first six weeks of school. This work should be done by the class under the direction of the teacher.

1. One bushel each of the following:
Clay, sandy loam, sand.
2. ¼ bushel leaf mold.
3. Seed collection as follows: Weed seeds, 15 kinds; Cereals, 15 kinds; Grasses: Annuals, 3 kinds; Perennials, 6 kinds; Legumes: For forage, 6 kinds; for seed, 10 kinds; Sorghums, 3 kinds.
4. Insect collection.
Fifteen kinds of insects injurious to farm crops.

Special Materials Located.

The following should be located and permission obtained from the owners for the use of the same when needed.

1. Four or more bushels of corn for use in corn judging.
2. Twenty plants of each of the following: (a) Wheat; (b) Oats; (c) Clover; (d) Alfalfa.
3. A portion of a field of corn (about 100 hills square) for lessons in:
 - (a) Estimating stand per acre.
 - (b) Estimating yield per acre.
 - (c) Study of the plant.
 - (d) Selection of seed.
 - (e) Study of weeds, insects, and diseases found in corn.
4. Farm animals for studying and judging pure bred stock:
 - (a) Horses; (b) Cattle; (c) Hogs; (d) Sheep; (e) Poultry.
5. Farm machinery for study.
6. Farms for farm judging.
7. Tools and seeds for demonstration plot.

Demonstration Plot.

1. Secure the use of an acre of ground for use in demonstrating the principles of agriculture through the growing of crops. It should be a fertile soil and located in a place as convenient to the high school as possible.

2. Measure it, compute its area, and, using a convenient scale, plot it. Divide this plot into as many sections as there are members of the class. Have each section extend the full length of the plot. (This arrangement will make it possible to cultivate by horse power or with push-plows.)

3. Ask each student to select, after careful consideration, the crop he wishes to grow. After all have reported their choice of crops, assign to each student one of the sections. Let the assignment be governed by the nature of the crop. Locate the tall-growing crops together and see that they do not shade the low-growing crops nor hide them from view.

4. Explain to the class the Demonstration Plot Note Books, and how they are to be kept. There are two of these note books. The first one is to be used in a study of the crop and for making a plan for growing the crop. The second one is a record of the actual work and of the development of the growing crop.

Divide the pages of the first note book into two columns as illustrated below. In the first column the student should make an outline of all the steps necessary to be taken in working out his chosen project and in the second column write all the principles he can find relating to these various steps, numbering them and placing under them the pages of the book in which he has read the principle. This note book should show definitely the preparation of the student for growing the crop. He should begin the work on the note book at the beginning of school and should have it completed by the time he begins actual work on the plot just before planting time. To keep up interest in this work a recitation period should be taken frequently to hear different individuals make reports on the principles they have learned and the progress they have made in forming their plans for growing the crop they have chosen. It should be kept in mind that the note book is only a means to an end. The preparation of the student for growing the crop is the immediate end, and learning the principles of agriculture the ultimate end.

Demonstration Plan Note Book.

Below will be found a suggestive form and outline. This is not intended to be a complete outline, but it is hoped that it will be sufficient to give the teacher an idea of the plan and the possibilities of teaching many of the principles of agriculture through the use of the demonstration plot.

Here is a partially worked out plan for the growing of a potato crop.

A STUDY OF THE POTATO AND PLANS FOR GROWING A CROP ON THE
DEMONSTRATION PLOT.

Steps to be taken in growing a crop of potatoes.	Principles relating to or governing the different steps to be taken.
Study of the Potato Plant.	<ol style="list-style-type: none"> 1. The potato was cultivated and used for food by the natives of America before the discovery of the new world and introduced into Europe about....., etc. <i>New International Encyclopædia.</i> 2. The potato is an annual and is propagated by means of tubers. These tubers are thickened underground stems with, etc. The tuber of the potato is a storehouse for....., etc. <i>Bailey's Vegetable Gardening, 301-309.</i> 3. In 1890 there were 28,046 acres of potatoes grown the United States, 4,071 acres in the Mississippi Valley,, etc. <i>Bailey's Vegetable Gardening, 301.</i> 4. The potato bears tubers at the expense of seed-bearing. <i>Bailey's Plant Breeding, 95-99.</i> 5. A cool climate is needed. <i>Bailey's Vegetable Gardening, 301.</i> (Many other facts can be gathered by the student from available sources.)
Study of Demonstration Plot Soil.	<ol style="list-style-type: none"> 1. Acid soil turns litmus paper red. <i>Vivian, 247.</i> <i>Burkett, 104.</i> <i>Lyon & Fippin, 352.</i> 2. Acid soil may be neutralized by use of lime. <i>Burkett, 105-106.</i> <i>Lyon & Fippin, 352-353.</i> <i>Vivian, 246-251.</i> 3. Lime improves physical condition, etc. <i>Vivian.</i> 4. The water-holding capacity of a soil depends upon, etc. <i>King, 157.</i> <i>Burkett, 42-43.</i> <i>Lyon & Fippin, 133-196.</i>

Steps to be taken in growing a crop of potatoes.	Principles relating to or governing the different steps to be taken.
	5. 6. (There is much material available for study on soils.)
Fertilizing the Soil.	
Seed Selection.	
Preparation of Seed Bed.	
Planting.	
Cultivation.	

Steps to be taken in growing a crop of potatoes.	Principles relating to or governing the different steps to be taken.
Insect Enemies and Diseases.	
Harvesting.	
Storing.	
Marketing.	

The second note book is a record of the actual growing of the crop. There are four items to record. In the first column, the date; in the second, the work done; in the third, the amount of time; in the fourth, general remarks, giving conditions of weather, soil, crop, etc. Pictures of the work and crop at different stages would add much to the note book.

Date.	Work done.	Time.	Remarks.
April 1, 1912....	Plowed.....	{ 30 minutes, 1 man.... 30 minutes, 2 horses... }	Soil inclined to turn up in clods.
April 2, 1912....	Harrowed....	{ 10 minutes, 1 man.... 10 minutes, 2 horses... }	Soil not very well pulverized. Drying out rapidly.
April 3, 1912....	About 2 inches rain fell.
April 4, 1912....	Harrowed....	{ 12 minutes, 1 man.... 12 minutes, 2 horses... }	Soil well pulverized and reasonably well packed.

Date.	Work done.	Time.	Remarks.
.....	Harvested . . .	— minutes	_____.
Time of growing season from time of sowing to time of harvest.		Total time used in growing, cultivating and harvesting crop.	Total yield and amount received from crop.

General Note Book.

Besides the note book for the acre demonstration plot there should be one in which the regular exercises, both experiments and field trips, including special services performed, should be written up. Each write up should include the following items:

1. Date.
2. Material or materials used including apparatus.
3. Procedure.
4. Principle or principles illustrated or observed.
5. References student has read relating to these principles in required library books and others.
6. If possible, photographs of field trips and special service. These should be taken in such a way as to illustrate the principle involved or the method of work. These pictures can be taken by members of the class who own cameras.

NOTE.—If loose-leaf note books are used, the same cover may be used for all three note books.

Community Service.

The teacher should make provision for the class, led by himself or by the county farm adviser, to perform some actual services that would require the class to put into practice some principle or principles which they have previously studied. An account of this work should be placed in the general note book of the student along with a picture, if possible, illustrating the work. Below are some things that might be undertaken.

1. Pruning orchard trees, ornamental trees, small fruit, etc.
2. Spraying orchard trees, garden vegetables, ornamental plants, etc.
3. Testing seed corn.
4. Identification of impurities in farm and garden seeds.
5. Vaccination of hogs for cholera.
6. Testing cattle for tuberculosis.
7. Testing milk.
8. Testing soil.
9. Planning and laying off ground for ornamental gardening.
10. Propagating and potting house plants.

The Teacher.

The teacher of agriculture should know as much about the subject as the teacher of history or mathematics knows about his subject. He should have completed not less than a two year's course in agriculture of college rank under instructors who have had at least a four year's course in a standard college of agriculture. For a teacher thus prepared the course is not a difficult one to teach, but one that requires much time in making preparation and plans. Before an experiment is begun the teacher should see that all the necessary material is at hand. Before each field trip he should go over the ground himself, and locate definitely the thing or things to be observed. He should often consult with the farmers of his community and arrange with them to have the class perform some service, the object of which would be to teach some principle or principles in agriculture which have been or will be taught. At the beginning of the year all the materials for the various exercises are either to be collected or arranged for.

All note books are to be carefully read, and if an exercise, whether an experiment or an observation lesson, is not satisfactory, the student should be required to repeat the exercise and report it

again. The teacher should require the note books be kept up with the class work and he should read them at least once each week.

Therefore the teacher who is afraid of "Mr. Toil" should not enter the field of teaching agriculture. On the other hand, it offers an inviting field for those who wish to get in close touch with the community life and thus be able to render valuable service and who, because of their preparation and fitness, can do efficient work,

Double Periods Daily.

The principles of agriculture should be taught not so much by the use of a textbook, but largely through laboratory exercises, field trips, and demonstration work both in connection with the demonstration plot and in performing services for farmers and others in the community, as elsewhere suggested. To do and plan all of this well requires much time of the teacher. Therefore in the assignment of classes to the various teachers in the high school, the time element in the teaching of agriculture should be considered equivalent to the time element in the teaching of any two subjects other than the sciences and should have assigned to it for use of both teacher and class two periods of forty minutes each daily.

Division of Time.

About six weeks should be given to the study of Plant Food, Soils and Soil Fertility; ten weeks to Farm Crops; six in the fall and four in the spring; seven weeks to Farm Animals, four in the fall and three in the spring; eight weeks during the winter, beginning in January, to Farm Management; five weeks to Plant Propagation, Plant Enemies and work on demonstration crops. The latter five weeks need not be continuous, but can be begun as soon as the conditions of the weather are suitable. In fact all during the year opportune times should be utilized for field trips, etc., even if it interferes for a day or two with the study of other topics.

References.

In the teaching of agriculture no one text should be followed, but all of the books available should be used in the study of the various topics. For this purpose a few references have been listed, and it is expected that the teacher will fill in other references from these and other books that are available. When Harper, Henry, Plumb and other authors' names are given in the references, they are meant to refer to the books in the required library list. When

Warren's name is used alone it refers to his *Elements of Agriculture*.

In outlining the exercises, Elliff's "A Unit in Agriculture" is referred to, because this book is used in most of the schools of the state. But this does not mean that Call and Schafer's Laboratory Manual will not receive equal recognition. Should Call and Schafer be used the teacher should substitute similar exercises for those outlined in this bulletin.

SYLLABUS OF THE COURSE IN AGRICULTURE.

PLANT FOOD.

For study and for discussion in the class room.

I. Elements plants need.

1. Nitrogen.
2. Phosphorus.
3. Potassium.
4. Calcium.
5. Other elements.

II. Plant food obtained where.

1. Air.
2. Water.
3. Soil.

III. Elements commonly deficient in soils.

1. Nitrogen.
2. Phosphorus.
3. Potassium.
4. Calcium.

IV. Elements unavailable as plant food.

Insoluble form.

Effect of lime, humus, cultivation and drainage on unavailable elements.

V. Functions of the different elements in plant growth and developments.

VI. Form of available plant food and how the plant gets it.

1. From the soil.
2. From the air.

VII. Formation and storage of food in the plant.

VIII. Elements composing plants at time of harvest.

References.

For teacher's preparation and for reading and written reports by individual students upon the foregoing topics.

I. *Soils*, Lyon and Fippin, 3-4; Warren, 60-61; *The Soil*, King, 76-83; *Soils*, Burkett, 52-61.

II. *Soils*, Lyon and Fippin, 1-3; Warren, 61-62; *The Soil*, King, 101-106.

III. Warren, 63, 132-135; *The Soil*, King, 107-134.

IV. *Soils*, Lyon and Fippin, 4, 68, 282; Warren, 113-114; *The Soil*, King, 101-110; *Soils*, Burkett, 62-70, 87.

V. Warren, 63-64, 132; *The Soil*, King, 96-99; 110-112.

VI. Warren, 64, 66, 67; *The Soil*, King, 142-153; *Soils*, Lyon and Fippin, 279-280.

VII. Warren, 68-70, 47-48.

VIII. Warren, 71.

Other References.

(To be supplied by the teacher.)

Laboratory Exercises.

The preparation of oxygen, hydrogen, nitrogen, carbon dioxide should be performed by the teacher before the class.

I. Exercise 41, 42, 43, 44, 45 *A Unit in Agriculture*.

II. Exercise 46, *A Unit in Agriculture*.

VI. (Exercises 21, 22, 23, 24, *A Unit in Agriculture*.)
(Exercise 26, *Elements of Agriculture*.)

VII. Exercises 28, 29, 30 and 31, *Elements of Agriculture* or similar exercises in Call and Schafer.

FARM SOIL.

For study and for discussion in class room.

I. The origin and formation of soil.

II. Substances composing an agricultural soil.

1. Rock and minerals.
 2. Water.
 3. Air.
 4. Living organisms.
 5. Decayed vegetable matter.
- III. Classification of soils according to size of particles.
1. Size of soil particles: (a) Gravel; (b) Sand; (c) Silt; (d) Clay.
 2. Names of soils: (a) Sand; (b) Loam; (c) Clay.
- IV. Water in the soil.
1. Free water.
 2. Capillary water.
 3. Film water.
 4. Hygroscopic water.
- V. Movement of water in the soil.
1. Gravitational movement.
 2. Capillary movement.
 3. Film movement.
- VI. Air in the soil.
1. Condition of soil necessary to admit air.
 2. Effect of free water on air in soil.
 3. Air a necessity to: (a) Plants; (b) Soil bacteria.
- VII. Temperature of the soil.
1. Heavy soil and temperature.
 2. Light soil and temperature.
- VIII. Organic matter in the soil.
- Sources: (a) Roots, stalks, straw, weeds; (b) Green crops plowed under; (c) Barnyard manure; (d) Other sources.
- IX. Living organisms in the soil.
1. Bacteria.
 2. Molds.
 3. Earthworms, etc.

References.

For teacher's preparation and for reading and written reports by individual students.

- I. *Soils*, Lyon and Fippin, 5-64; *The Soil*, King, 1-26, 36-69; *Soils*, Burkett, 7-22.
- II. Warren, 75-76; *Soils*, Burkett, 23-33.
- III. *Soils*, Lyon and Fippin, 66-101; *The Soil*, King, 99-101; *Soils*, Burkett, 34-51.

- IV. *Soils*, Lyon and Fippin, 133-165; *The Soil*, King, 154-162; *Soils*, Burkett, 152-175.
- V. *Soils*, Lyon and Fippin, 165-266; *The Soil*, King, 162-206; *Soils*, Burkett, 164-206.
- VI. *Soils*, Lyon and Fippin, 432-447; *The Soil*, King, 178-183, 239-252.
- VII. *Soils*, Lyon and Fippin, 448-464; *The Soil*, King, 218-238.
- VIII. *Soils*, Lyon and Fippin, 119-132; *The Soil*, King, 64-68, 94-96; *Soils*, Burkett, 286.
- IX. *Soils*, Lyon and Fippin, 388-431; *The Soil*, King, 124-134; *Soils*, Burkett, 108-151.

Other References.

(To be supplied by the teacher.)

Laboratory Exercises.

- I and III. Exercise 17, *A Unit in Agriculture*.
 - II. Exercises 13, 14, 15 and 16, *A Unit in Agriculture*.
 - V. Exercises 19 and 20, *A Unit in Agriculture*.
 - VI. Exercise 25, *A Unit in Agriculture*.
 - VII. Exercises 18 and 26, *A Unit in Agriculture*.
 - VIII. Exercise 15, *A Unit in Agriculture*.
 - IX. Exercise 47, *A Unit in Agriculture*.
- Or similar exercises in Call and Schafer.

SOIL FERTILITY.

For study and for discussion in the class room.

- I. Why soils become less productive.
 - 1. Decrease of moisture holding capacity.
 - 2. Conditions unfavorable for the development of soil organisms.
 - 3. Erosion by wind or water, carrying away the fertile surface soil.

4. Escaping of nitrogen set free by some denitrifying agency: (a) Leaching; (b) Air.
5. Constant cropping.
6. Single crop system.
7. Decrease of humus supply.
- II. How soils may become more productive.
 1. Rotation of crops.
 2. Conservation of moisture.
 3. Fertilizers and amendments: (a) Commercial fertilizers; (b) Barnyard manure; (c) Lime; (d) Other fertilizers and amendments.
 4. Increase of humus: (a) Barnyard manure; (b) Green crop plowed under.
 5. Drainage.
 6. Tillage.

References.

For teacher's preparation and for reading and written reports by students.

I. (References to be supplied by the teacher.)

II.

1. *Soils*, Burkett, 266-281.
2. *Soils*, Burkett, 164-205; Farmers' Bulletin No. 266.
- 3 and 4. *Soils*, Burkett, 206-254.
5. *Soils*, Burkett, 152-163.

General References, Farmers' Bulletin, Nos. 44, 192, 222, 225, 237, 245, 259, 278, 327, 342.

Other References.

(To be supplied by teacher.)

Laboratory Exercises.

- II. 3. Exercises 45, 66 and 67, *A Unit in Agriculture*.
Home experiments in the garden.
5. Exercise 27, *A Unit in Agriculture*, or similar exercises in Call and Schafer.

FARM CROPS.

I. CORN.

1. Early history of corn.
2. Annual production in U. S.
3. Annual production in Missouri.
4. Soil and climatic conditions favorable to corn growing:
 - (a) Character of soil.
 - (b) Climate—temperature, rain, sunshine, length of growing season.
5. Why raise corn.
 - (a) Food.
 - (b) Tillage of soil.
 - (c) Care of corn crop in non-competition with care of other farm crops.
6. Types of corn: (a) Pod corn; (b) Pop corn; (c) Sweet corn; (d) Flint corn; (e) Dent corn.
7. Varieties grown in Missouri.
 - (a) Boone County White.
 - (b) Reid's Yellow Dent.
 - (c) St. Charles White.
 - (d) Leaming.
 - (e) St. Charles Yellow.
 - (f) Commercial White.
8. Varieties grown in Missouri.
9. Study of the corn plant.
 - (a) Roots.
 - (1) Growth, nature of.
 - (2) Primary and secondary roots.
 - (3) Conditions affecting growth of roots.
 - (b) Stalk.
 - (c) Leaves.
 - (d) Flower.
 - (1) Male—tassel—pollen.
 - (2) Female—silk—pollinization.
 - (e) Ear.
 - (1) Type of ear of Dent Corn.
 - (2) Position on stalk.
 - (f) Kernel.

10. Seed corn, selection and storage.
 - (a) Seed corn adapted to your own locality.
 - (b) Time of harvesting seed corn.
 - (c) Ears to select.
 - (d) Testing ears for germination qualities.
 - (e) Storing of seed corn.
 - (f) Effect of moisture and freezing on seed corn.
11. Testing seed corn.
 - (a) Relation of testing to stand of corn.
 - (b) Result of poor stand on yield of corn.
 - (c) Time to test seed corn.
 - (d) The testing box, how made, how filled.
 - (e) System of arranging ears to be tested and of placing grains in germination box.
 - (f) Reading the test.
 - (g) What ears to reject.
 - (h) Grouping of ears according to size of grain.
12. Corn judging.
 - (a) Use of score card.
 - (b) Judging a single ear.
 - (c) Judging a group of ears.
13. Corn growing.
 - (a) Plowing.
 - (b) Treatment of ground after plowing.
 - (c) Planting.
Time, depth, distance of hills apart, number of stalks per hill, a perfect stand, replanting.
 - (d) Drilling corn.
 - (e) Listing corn.
Preparation of ground and use of the lister.
 - (f) Cultivation of corn.
Weed destruction, dust mulch, depth of cultivation, when to cultivate, kind of cultivators.
 - (g) Harvesting corn.
When corn is mature, time to harvest, how harvested, storage, cribs, shrinkage, computing capacity of cribs both rectangular and circular.
14. Corn silage.
 - (a) Early history of corn silage.
 - (b) Principles of preservation of food.

- (1) Exclusion of air.
- (2) Fermentation.
- (3) Other factors.
- (c) Time and method of planting and harvesting corn for silage.
 - (1) Filling the silo.
- (d) Feeding silage.
 - (1) Value of silage as a feed.
 - (2) Does silage pay?
- 15. Corn products.
- 16. Corn breeding: (a) Ear-to-row method.

References.

For teacher's preparation and for reading and written reports by individual students.

Corn, Bowman and Crossley.

Plant Breeding, Bailey.

4. *Farm Management*, Warren, 44-45.

Farmers' Bulletins, Nos. 233, 149, 199, 253, 292, 303, 313, 317.

Other References.

(To be supplied by the teacher.)

Laboratory Exercises.

- 9. Exercises 1, 2 and 3, *A Unit in Agriculture*.
- 11. Exercise 6, *A Unit in Agriculture*.
- 12. Exercises 4 and 5, *A Unit in Agriculture*, or similar exercises in Call and Schafer.
- II. WHEAT.
 - 1. Origin and importance.
 - 2. The grain; head; complete plant.
 - 3. Important varieties.
 - 4. Varieties grown in your community.
 - 5. Selection of seed.
 - 6. Methods of cultivation: (a) Climatic conditions favorable to wheat; (b) Preparation of ground for sowing.
 - (1) Time of plowing.

- (2) Depth of plowing.
- (3) Preparation other than plowing.
- (4) Sowing.
- 7. Harvesting and marketing wheat.
- 8. Wheat products.
- 9. Wheat enemies and remedies: (a) Rust; (b) Hessian fly; (c) Chinch bug; (d) Smut.

References.

For teacher's preparation and for reading and written reports by individual students: Farmers' Bulletins, Nos. 132, 250.

Other References.

(To be supplied by the teacher.)

Laboratory Exercises.

- 2. Exercises 7, 8, 9, *A Unit in Agriculture*.
- 8. Exercise 42, *Elements of Agriculture*.

III. OTHER CEREALS.

- 1. Oats, barley, rye.
(Use same outline as for wheat.)

IV. THE LEGUMES.

- 1. Red Clover.
 - (a) Head.
 - (b) Roots.
 - (1) Nodules on roots.
 - (c) Methods of reproduction.
 - (1) By seed.
Methods of fertilization.
 - (2) By stolens.
 - (d) Selection of seed.
 - (e) Sowing—when—how.
 - (f) Advantages of growing clover.
 - (g) Harvesting and storing crop.
Number of crops per year.
Seed crop.

- (h) How long clover lives.
- (i) Enemies to clover.
- 2. Alfalfa.
 - (a) Root system—nodules.
 - (b) Entire plant.
 - (c) Soil and climatic conditions favorable to alfalfa.
 - (d) Influence of lime and inoculation upon the growth of alfalfa.
 - (e) Number of crops per year.
 - (f) Value as hay.
- 3. Annual Legumes.
 - (a) Cowpeas.
 - (b) Soy beans.
 - (c) Field peas.
 - (d) Vetch.

References.

For teacher's preparation and for reading and written reports by individual students.

1. *Farm Management*, Warren 48-49.

2. *Farm Management*, Warren, 48.

Farmers' Bulletins, 58, 89, 121, 194, 237, 260, 278, 315, 318, 331, 339, 372.

Other References.

(To be supplied by the teacher.)

Laboratory Exercises.

1, 2, 3, Exercise 11, *A Unit in Agriculture*.

Exercise 59, *Elements of Agriculture*, page 241.

V. Perennial grasses.

- 1. Character of perennial grasses.
- 2. Grasses for meadow—habits of growth.
- 3. Grasses for pasture—habits of growth.
- 4. Varieties of grasses and the study of each: (a) Timothy; (b) Red Top; (c) Kentucky Blue Grass; (d) Orchard Grass; (e) Meadow Fescue; (f) Bermuda Grass; (g) Other grasses.
- 5. Varieties of grasses in your community and purposes of growing each.

References.

For teacher's preparation and for reading and written reports by individual students.

Farmers' Bulletins, 66, 331.

Farm Management, Warren 48-49.

Other References.

(To be supplied by the teacher.)

Laboratory Exercises.

Exercise 57, page 239, *Elements of Agriculture*. (Optional.)

VI. COTTON.

1. The plant—roots—stem—pod and lint.
2. Important types of cotton: (a) Upland; (b) Sea Island.
3. Type grown in your community.
4. Climatic and soil conditions favorable to its growth.
5. Preparation of soil and planting.
6. Methods of cultivation and harvesting.
7. Ginning—baling—marketing.
8. Cotton seed—use—products.
9. Insect enemies.

References.

For teacher's preparation and for reading and written reports by students:

Farmers' Bulletins, Nos. 36, 48, 209, 211, 217, 285, 286, 290, 302, 314, 326, 333, 344, 501.

Other References.

(To be supplied by the teacher.)

VII. TOBACCO.

1. Selecting the seed.

2. Seed bed and its preparation.
3. Sowing the seed: (a) How much seed to sow; (b) Time of sowing.
4. Planting—watering.
5. Cultivation.
6. Fertilizers.
7. Topping.
8. Cutting.
9. Saving seed.
10. Insect pests and how to combat them.
11. Method of harvesting, storing and curing tobacco.
12. Markets and marketing.

References.

For teacher's preparation and for reading and written reports by individuals students.

Farmers' Bulletins, Nos. 60, 82, 83, 126, 343, 523.

Other References.

(To be supplied by the teacher.)

VIII. POTATOES.

1. A study of the Irish potato.
2. Effect of large and small potatoes on yield.
3. Selection of seed potatoes.
4. Principal varieties.
5. Methods of cultivation.
6. Enemies of Irish potatoes and how to fight them; scab, dry rot, potato beetles.
7. Sweet potatoes: Principal varieties, method of culture, yield and uses as compared with Irish potatoes.
8. Improvement of potatoes.
(a) Selection from best yielding hills.

References.

For teacher's preparation and for reading and written reports by individual students. (To be supplied by the teacher.)

Laboratory Exercises.

Exercise 12, *A Unit in Agriculture*.

FARM ANIMALS.

I. HORSES AND MULES.

1. Origin and history.
2. Types.
 - (a) Light (Plumb, 33; Harper, 3-4; Warren, 302.)
 - (b) Heavy (Plumb, 92; Harper, 3-4; Warren, 302.)
3. Breeds of Horses.
 - (a) Light Breeds: (1) Thoroughbred; (2) Arabian; (3) American Saddle; (4) Standardbred.
 - (b) Coach Breeds: (1) Hackney; (2) German; (3) French; (4) Cleveland Bay.
 - (c) Draft Breeds: (1) Percheron; (2) Clydesdale; (3) Shire; (4) Belgium.

The following points should be emphasized in studying the breeds of horses: History, type, distribution, color markings, comparison and use.

4. Pony Breeds.
5. Donkeys and Mules. (Harper, 31; Plumb, 155-169.)
6. Judging horses.
 - (a) How to estimate the age.
 - (b) Detecting unsoundness.
 - (c) Explanation and use of the score card.
 - (1) General characteristics in Light and Heavy Horses.
 - (2) Detail characteristics in Light and Heavy Horses.
7. Market classification of horses and mules.
Harper, 51.
Warren, *Farm Management*, 583.
8. Care and management of horses: (a) Feeding; (b) Selecting and breeding; (c) Care of horses' feet and teeth; (d) Grooming; (e) Training the colt; (f) Harness and harnessing.
9. Diseases.—Roberts.

References.

For teacher's preparation and for reading and written reports by individual students.

1. *Types and Breeds of Farm Animals*, Plumb, 1-7.
Animal Husbandry for Schools, Harper, 21-32.

2. (a) Plumb, 33; Harper 3-4; Warren, 302.
(b) Plumb, 92; Harper, 3-4; Warren, 302.
3. (a) Plumb, 14-26; Harper, 4-14.
(b) Harper, 14-20; Plumb, 63-92.
(c) Harper, 20-29; Plumb, 92-142; Warren, 303-306.
4. Plumb, 146-155; Harper, 29-31.
5. Plumb, 155-169; Harper, 31.
6. Warren, 308-321; Harper, 34-53.
7. Harper, 51; *Farm Management*, Warren, 57-73.
8. Harper, 54-102; Henry, 250-287.
9. Harper, 38-40.

Other References.

Laboratory Exercises.

6. Exercise 57 and 58, *A Unit in Agriculture*.

II. CATTLE.

1. Origin and history.
2. Types: (a) Dairy; (b) Beef.
3. Breeds of cattle.—(Ferguson and Lewis, 198-204; Mayne and Hatch, 331-340; Harper, 105-128.)
(a) Major breeds of dairy cattle: (1) Jersey; (2) Guernsey; (3) Ayrshire; (4) Holstein-Friesian.
(The following points should be emphasized in the study of the above breeds of dairy cattle: Origin; Distribution; Condition of country where originated; Form and Characteristics; Milk and Butter Fat Records.)
(b) Minor breeds of dairy cattle: (1) Dutch Belted; (2) Brown Swiss; (3) Kerry.
(c) Dual purpose breeds: (1) Shorthorn; (2) Red Polled; (3) Polled Durham; (4) Devon.
(d) Major breeds of beef cattle: (1) Shorthorn; (2) Hereford; (3) Aberdeen-Angus; (4) Gallo-way.

(In making reports on the beef breeds the student should take into consideration: Origin

and Distribution; Form and Characteristics; Comparisons.)

- (e) Minor breeds of beef cattle: (1) Polled Durham; (2) Devon; (3) Red Polled; (4) Red Sussex; (5) West Highland.
4. Judging cattle: How estimate the age; Detecting unsoundness; Explanation and use of the score card; General characteristics in dairy and beef cattle; Detail characteristics in dairy and beef cattle.
5. Care and management of beef cattle:
 - (1) Feeding—winter stockers—summer feeders—winter feeding—getting cattle on feed—value of the silo in full feeding.
 - (2) Equipment for summer feeding.
 - (3) Equipment for winter feeding.
6. Care and management of dairy cattle:
 - (1) Selection—Starting the herd.
 - (2) Keeping records.—The scale and Babcock tester.
 - (3) Effect of feed upon quality of milk.
 - (4) Effect of feed upon quantity.
 - (5) Period of lactation.
 - (6) Seasonal variation.
 - (7) Time of milking.
 - (8) Age of the cow.
 - (9) Comfortableness of the cow.
 - (10) Feeding the milking cow—The kind of ration; Abundant, Palatable, Succulent, Balanced.
 - (11) Milk products: Milk—composition and uses, commercial products, home butter making, home cheese making, value of the cream separator.
 - (12) Calf raising.
 - (13) Sanitary milk.
 - (14) Dairy equipment.
7. Diseases of cattle.

References.

For teacher's preparation and for reading and written reports by individual students.

1. Plumb, 249-307; Harper, 105-119; Warren, *Elements of Agriculture*, 223-330.
3. Ferguson and Lewis, 196-204; Mayne and Hatch, 331-340; Harper, 105-128.

4. Harper, 130-143; Ferguson and Lewis, 203; Mayne and Hatch, 331; Warren, 343-344.
5. Harper, 144-171; Henry, 431-441, 333-362; Ferguson and Lewis, 250; Warren, 292-299.
6. Harper, 144-155; Ferguson and Lewis, 233-246; Henry, 431; *Farm Management*, Warren, 446; Halligan, 318-321; Powell, 99.

Other References.

Laboratory Exercises.

4. Exercises 59 and 60, *A Unit in Agriculture*.
6. Exercise 71, *A Unit in Agriculture*.

III. SWINE.

1. Origin and history.
2. Types: Lard; Bacon.
3. Breeds.
 - (a) Lard Breeds of swine: Poland China, Berkshire, Duroc Jersey, Chester White, Hampshire. (See Harper.)
 - (b) Bacon breeds of hogs: Yorkshire, Tamworth.
Study the above breeds with reference to origin, distribution, characteristics and comparison.
4. Judging swine. (Harper, 275-282.)
Explanation and use of the score card.
 - (a) General appearance of the lard and bacon types of hogs.
 - (b) Detail characteristics of the lard and bacon types of hogs.
5. Market classification of hogs. (See Market quotations; Harper, 282.)
 - (a) Location of the principal hog markets.
 - (b) Changes of market demand with seasons.
 - (c) Cuts of pork.
6. Care and Management of Hogs: (a) Feeding; (b) Breeding; (c) Dipping; (d) Shelter; (e) Hog lot and wallow; (f) Raising pigs; (g) Swine equipment; (h) Curing of meat in the home.

7. Diseases.
Effect and control.

References.

For teacher's preparation and for reading and written reports by individual students.

1. Plumb, 467-551; Harper, 260-261.
2. Halligan, 352-358; Mayne and Hatch, 359-362; Ferguson, 217.
4. Harper, 275-282.
5. Harper, 282; Market quotations in stock journals and in daily papers.
6. Harper, 284-303; Henry, 517-580; Warren, 61.
7. Harper, 301-303.

Other References.

Laboratory Exercises.

4. Exercise 62, *A Unit in Agriculture*.

IV. SHEEP PRODUCTION.

1. Origin and History.
2. Types: Fine wool; Mutton.
3. Breeds of sheep.
 - (a) Fine wool breeds of sheep: (1) American Merino; (2) Delaine Merino; (3) Rambouillet.
 - (b) Mutton breeds of sheep: (1) Southdown; (2) Shropshire; (3) Hampshire; (4) Oxford; (5) Suffolk; (6) Dorset; (7) Cheviot.
 - (c) Long wool breeds of mutton sheep: (1) Leicester; (2) Cotswold; (3) Lincoln; (4) Black-faced Highland.
 - (d) Goats: (1) Angora goat; (2) Milk goat.
4. Judging Sheep:
 - (a) Catching and Holding.
 - (b) How to Estimate the Age.
 - (c) Explanation and Use of the Score Card.
 - (1) General appearance of the different Breeds of Sheep.

(2) Detail characters of the different Breeds of Sheep.

5. Market Classification of Sheep.

Class.

Sub-class.

- | | |
|--|---------------------|
| | (1) Lambs. |
| (a) Mutton sheep (Native and western sheep.) | (2) Yearlings. |
| | (3) Wethers. |
| | (4) Ewes. |
| | (1) Lambs. |
| (b) Feeder sheep (Western sheep.) | (2) Yearlings. |
| | (3) Wethers. |
| | (4) Ewes. |
| | (5) Rams and culls. |
| (c) Breeding sheep (Native and western sheep.) | (1) Ewes. |
| | (2) Bucks. |

6. Care and Management of Sheep: (a) Feeding the flock; (b) Fattening sheep; (c) Dipping; (d) Shearing; (e) Breeding; (f) Buying the feeders; (g) Growing the feed for fattening the sheep; (h) Marketing the fat sheep; (i) Raising lambs for early market; (j) Practical sheep barns.

7. Diseases—Effect and remedy.

References.

For teacher's preparation and for reading and written reports by individual students.

1. Harper, 199-200; *Farm Management*, Warren, 61 and 205; Halligan, 345-346; Warren, 353-355.
- 2 and 3. Plumb, 339, 375 and 456; Harper, 199-221; Mayne and Hatch, 353; Warren, 353-354; Ferguson and Lewis, 220-223.
4. Harper, 222-230.
5. Harper, 230.
6. Harper, 232-256; Henry, 442-458; Halligan, 428.

Other References.

Laboratory Exercises.

4. Exercise 61, *A Unit in Agriculture*.

V. POULTRY RAISING.

1. Origin and history.
2. Classes.—There are 104 standard and a large number of non-standard varieties of chickens raised in this country. The standard varieties are divided into fourteen classes, including the turkeys, ducks and geese. They are as follows: (a) American class; (b) Asiatic class; (c) English; (d) Mediterranean; (e) Polish; (f) Dutch; (g) French; (h) Game and Game Bantam class; (i) Oriental Game and Bantam class; (j) Ornamental Bantam class; (k) Miscellaneous class; (l) Ducks; (m) Geese; (n) Turkeys.
3. Types and breeds.
 - (a) Egg Type of Fowls—Mediterranean class, Dutch class and the Redcaps.
 - (b) Meat Type of Fowls—Asiatic class, Dorkings and Indian Games.
 - (c) General Purpose Breeds—American class, Orpington and the Houdons.
 - (d) Ornamental Breeds of Fowls—Polish, Game and the Game Bantam class, Oriental Game and Bantam class, Ornamental Bantam class and the Miscellaneous class. (Study the characteristics of the types and breeds.)
4. Judging poultry.
 - (a) How to estimate the age.
 - (b) Explanation and use of the score card: (1) comparative judging; (2) Score card judging; (3) Detail characters of fowls.
5. Feeding poultry: (a) Essentials of feeding; (b) Feeding young chicks; (c) Feeding for egg production; (d) Feeding for meat production.
6. Care and management of poultry: (a) Importance of the poultry industry in the United States; (b) Importance of the poultry industry in Missouri; (c) Laying out a poultry farm; (d) Selection; (e) Poultry Equipment: Housing, Fencing, Incubation.
7. Diseases: Effect and Remedy.

References.

For teacher's preparation and for reading and written reports by individual students.

Harper, *Animal Husbandry for Schools*, 307-348.

Brigham, *Progressive Poultry Culture*.

Warren, 363-371.

Other References.

Laboratory Exercises.

2. Exercise 44, page 374, Harper.

4. Exercise 43, page 374, Harper.

Study of the Egg, Exercise 50, page 378, Harper.

Preserving Eggs, Exercise 51, page 381, Harper.

FARM MANAGEMENT.

1. Personal characteristics desirable for a farm.

2. Profits to be expected in farming.

3. Cost of living on farms.

4. Choice of farming as an occupation.

5. Types of Farming.

(a) Influence of climate, soil, topography, on type of farming.

(b) Transportation and type of farming.

(c) Supply and demand as related to the type of farming.

(d) Capital and type of farming.

(e) Effect of weeds, insects, and diseases on type of farming.

(f) The personal factor and type of farming.

6. Diversified and specialized farming.

7. Intensive and extensive farming.

8. Maintaining the fertility of the land.

9. Live stock as related to farm management.

10. Size of farms and plan of farms and farm buildings.

11. Farm capital.

12. Methods of renting land.

13. Farm labor.
14. Farm equipment.
15. Cropping system.
16. Marketing farm products.
17. Farm records and accounts.

References.

For teacher's preparation and for reading and written reports by individual students.

Farm Management, Warren.

Other References.

(To be supplied by the teacher.)

Laboratory Exercises.

8. Exercises 66 and 67, "*A Unit in Agriculture*."
10. Exercises 63, 64, 65, "*A Unit in Agriculture*."

ENEMIES OF PLANTS.

1. Insects.
 - (a) Biting insects, as potato beetle, cabbage worm, etc.
 - (b) Sucking insects, as chinch bug, plant lice, squash bug, San Jose scale, etc.
2. Diseases caused by certain bacteria, as fire blight in pear and apple tree.
3. Fungus diseases, as brown rot on peaches, potato scab, rust on wheat and oats, etc. Ex. 47.
4. Spraying to control insects and diseases.
 - (a) Fungicides—Bordeaux mixture, lime-sulphur, etc.
 - (b) Poisons for biting insects, Paris green, arsenate of lead, hellebore, etc. Ex. 48.
 - (c) Contact remedies for sucking insects—lime-sulphur, tobacco, carbon bisulphide, etc.
5. Identification of injurious insects and preparation of collection. Exs. 49, 50, 51, 52, 53.

References.

(To be supplied by the teacher.)

Laboratory Exercises.

3. Exercise 47, *A Unit in Agriculture*.
4. Exercise 48, *A Unit in Agriculture*.
5. Exercises 49, 50, 51, 52, 53.

NOTE.—This collection should be as complete as possible, well mounted and increased from year to year. It should include all the more common insect enemies of corn, wheat, potatoes, orchard fruits and garden plants.

PLANT PROPAGATION.

I. Propagation of Seeds.

1. Process of germination.
 - (a) Absorption of moisture.
 - (b) Chemical changes of compounds in the seed from insoluble to soluble substances.
 - (c) The production of heat.
2. Conditions of germination: (a) Vitality of seed; (b) Moisture; (c) Heat; (d) Air.
3. Vitality of seeds conditioned by: (a) Maturity; (b) Age; (c) Size; (d) Kind; (e) Extremes of temperature; (f) Repeated germination.
Exs. 28, 29, 30.
4. Methods of production and preservation of most important seeds.
5. Selecting seeds of different crops.
6. Seed testing.
 - (a) For germination (see Ex. 6).
 - (b) For impurities. Ex. 31.
7. Treatment of refractory seeds.
 - (a) By freezing (hickory, oak, walnut, hazel, pear, apple, peach, plum, etc.)
 - (b) By scalding (black locust, honey locust, Kentucky coffee bean).

(c) By stratifying (berries, blackberry, strawberry, raspberry, rose).

II. Propagation Other than by Seeds. Ex. 32.

1. Spores—mushrooms, ferns.
 2. Root stocks—iris, calamus, June grass.
 3. Stolens or runners—strawberry.
 4. Suckers or root stalks—blackberry.
 5. Bulbs or corms—onion, crocus.
 6. Tubers—Irish potato, artichoke.
 7. Cuttings—grape, currant.
 8. Grafts—apple, pear.
 9. Layers—grape, ornamental vines.
- Exs. 33, 34, 35, 36, 37.

References.

For teacher's preparation and for reading and written reports by individual students. (To be supplied by the teacher.)

Laboratory Exercises.

- I. 1, Exercises 28 and 29, *A Unit in Agriculture*.
- 2, Exercises 30, 38, 39, 40, *A Unit in Agriculture*.
- 6, Exercises 31 and 32, *A Unit in Agriculture*.
- II. 7, Exercise 33, *A Unit in Agriculture*.
- 8, Exercises 34, 35, 36 and 37, *A Unit in Agriculture*.

SUPPLEMENTARY LIST OF LIBRARY BOOKS.

After the required list of library books has been purchased it may be desirable for the school to purchase a number of other books, or individual students may become interested in special subjects and wish to purchase books for their own use. The following list may be useful in making the selection :

Carver: <i>Principles of Rural Economics.</i> Ginn.....	\$1.30
Burkett and Swartzel: <i>Farm Arithmetic.</i> Orange Judd.....	1.50
Bailey: <i>Cyclopedia of American Agriculture</i> , 4 vols. Macmillan	20.00
Ogden: <i>Rural Hygiene.</i> Macmillan.....	1.50
Belcher: <i>Clean Milk.</i> Orange Judd.....	1.00
Bailey: <i>Farm Buildings.</i> Sanders.....	2.00
Bailey: <i>Insect Pests of Farm, Orchard and Garden.</i> Wiley.....	3.00
Osterhaut: <i>Experiments with Plants.</i> Macmillan.....	1.25
Davidson: <i>Agricultural Engineering.</i> Webb.....	1.50
Roberts: <i>The Horse.</i> Macmillan.....	1.25
Voorhees: <i>Fertilizers.</i> Macmillan.....	1.25
Smith: <i>Profitable Stock Feeding.</i> Smith.....	1.50
King: <i>Ventilation.</i> F. H. King, Madison, Wis.....	.75
Davidson & Chase: <i>Farm Machinery and Farm Motors.</i> Orange Judd.....	2.00
Taylor: <i>Agricultural Economics.</i> Macmillan.....	1.25
Davidson: <i>Agricultural Engineering.</i> Webb.....	1.50
Hunt: <i>Cereals in America.</i> Orange Judd.....	1.75
Spillman: <i>Farm Grasses in the United States.</i> Orange Judd.....	1.00
Shaw: <i>Soiling Crops and the Silo.</i> Orange Judd.....	1.50
Coburn: <i>The Book of Alfalfa.</i> Orange Judd.....	2.00
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